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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/698,706	10/27/2000	Cheng Guo	AMAT 5264	6131

32588 7590 02/27/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

MOHAMEDULLA, SALEHA R

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 02/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/698,706

Applicant(s)

GUO ET AL.

Examiner

Saleha R. Mohamedulla

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) 24-46 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8-10, 16-18 and 23 is/are allowed.
- 6) ☒ Claim(s) 1-5, 13, 20 and 22 is/are rejected.
- 7) ☒ Claim(s) 6, 7, 11, 12, 14, 15, 19 and 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. The Applicant's election of claims 1-23, in Paper No. 4, is acknowledged. Because the Applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 1-23 are considered and claims 24-46 are withdrawn from consideration.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by US# 4,827,138 to Randall.

Randall teaches a grid-like mask. Figure 3 shows square shapes that are preferred in the construction of the mask (col. 5, lines 5-10). The mask forms a screen that contains a multiplicity of openings. The openings extend through the entire thickness of the screen from the top surface to the bottom surface (col. 6, lines 3-18). Filler material is added within the openings of the screen. The specific material used as the filler material is not critical to the operation of the mask (col. 6, lines 39-42). The filler material need not entirely fill the openings (col. 6, lines 65-68). The filler material may be spun on or may be applied using chemical vapor

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deposition. Regardless of the application technique, the filler material is applied over the entire surface of the screen. At this point, the screen and filler form a mask blank (col. 7, lines 5-15). Figure 6 shows the removal of the filler material from selected portions of the screen to form a programmed mask. A resist material may serve as the filler. With this type of filler, a programmed mask may be produced by exposing a particular pattern on a mask blank using (see Figure 5) electron beam lithography. Randall teaches that the techniques for exposing such a pattern are conventional. The filler is then removed from selected portions of the mask blank by development (col. 7, lines 25-40). Because the filler was exposed to electron beam lithography in a pattern, a mask was formed over the filled screen. Because Randall teaches all the openings in the screen are initially filled, Randall teaches the limitations of claim 22. Therefore, Randall teaches the limitations of claims 1 and 22.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-5 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 4,827,138 to Randall in view of US# 6,168,890 to Takahashi.

5. Randall teaches the limitations discussed above in paragraph 2. As discussed above, Randall teaches the filled grid is exposed to a pattern of electron beam radiation. Because Randall teaches all the openings in the screen are initially filled, Randall teaches the limitations

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of claim 5. The claim does not require that the sets are separately filled. Randall does not teach that the mask formed over the filled substrate is a stencil mask or comprises a membrane layer covered by a mask layer. Takahashi teaches masks for electron beam or charged beam lithography. Takahashi teaches that known types of masks used in charged beam lithography include stencil masks (col. 1, lines 30-40). Takahashi also teaches a conventional mask is a scattering transmission mask which includes a scattering body supported by a membrane that functions as a mask substrate (col. 2, lines 27-32). The membrane is sufficiently thin to allow transmission of charged particles (col. 2, lines 4-6).

The references are analogous art as they are drawn to charged particle beam exposure. It would have been obvious to one of ordinary skill in the art to use the conventional charged beam masks as described in Takahashi in the electron beam method of Randall as Randall teaches conventional techniques for exposing the filled screen to a pattern using electron beam lithography (col. 7, lines 34-36).

6. Claims 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over US# 4,827,138 to Randall in view of US# 6,168,890 to Takahashi as applied to claim 4 above, and further in view of US# 5,899,728 to Mangat et al.

Randall in view of Takahashi teaches the limitations discussed above in paragraph 5. Randall in view of Takahashi does not teach forming a mask layer over a second substrate, bonding the membrane layer of the second substrate to the first substrate in a manner to expose the second substrate and removing selectively the second substrate. Mangat teaches forming a lithographic mask. In Figure 3, Mangat teaches processing two substrates in a first substrate

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processing box 300 and second substrate processing box 200. A first substrate 301 is obtained that has a first base 310 and a first layer 320 over the first base first side 311 of first base 310 (col. 4, lines 23-34). The first layer 320 is deposited over the first base 310 of the first substrate 301. Throughout the first and second substrate processing boxes 300 and 200, different layers and films are deposited using conventional film deposition techniques (col. 4, lines 48-50). At mask processing steps 315 through 335, the first layer 320 is patterned as is the entire thickness of the first base 310 to form a first pattern 351 at step 335 (col. 4, lines 50-55). In the second substrate processing box 200, a second substrate 201 has a second base 210 (col. 5, lines 15-20). The second base 210 also has a second base first side 211 and a second base second side 212. At step 205, a second layer 220 is deposited over the second base 210, where the second layer 220 is a membrane material used for the mask (col. 5, lines 30-32). The third layer 240, that is used as a scatterer layer, is formed over the second layer 220, and over a fourth layer 230. At step 400, the first substrate 310, that is at processing step 335, is bonded with the second substrate 210, that is at a process step 235, to form the structure at step 400. The bonding of the first substrate 310 and the second substrate 210 is performed by conventional bonding techniques familiar to those skilled in the art, for example anodic bonding, epoxy bonding, thermal compression bonding or other similar bonding techniques. Specifically, to achieve the structure at step 400, the first layer 320 of the first substrate 301 is bonded to the second base second side 212 of the second substrate 201 at step 235 (col. 6, line 24-35).

The references are analogous art as they are drawn to electron beam processing methods. It would have been obvious to one of ordinary skill in the art to use the patterning and bonding method of Mangat in the method of Randall in view of Takahashi as Mangat teaches that

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simultaneous processing of first and second substrates does not require the use of protective layers, thereby reducing the number of steps, that is, the additional steps of forming and removing protective layers. In addition, the processing of the first and second substrates has been performed on a first 310 and second 210 base, which is much easier than processing on thin membranes (col. 6, lines 9-25).

Allowable Subject Matter

7. Claims 6, 7, 11, 12, 14, 15, 19 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art does not teach or suggest that the first set of windows is approximately one-half the total number of windows to be formed and the second set includes remaining windows to be filled. The prior art does not teach or suggest placing in a mold which is shaped to facilitate the formation of a support structure a plurality of parallel minor struts, and forming in the mold a support structure that comprises a frame and a plurality of major struts that are orthogonal and attached to the minor struts with the major and minor struts defining a plurality of windows arranged in a two dimensional array of rows and columns. The prior art does not teach or suggest that the second substrate is first implanted with ions to create in its interior an ion implanted region and the second substrate is removed in part by cleaving along the ion-implanted region. The prior art does not teach or suggest forming in a substrate a set of windows spaced apart by major strut portions of the substrate, forming a plurality of spaced apart grooves in the major strut portions of the substrate and placing one of a plurality of minor strut elongated strips in each of the grooves. The prior

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art does not teach or suggest that the support structure comprises major struts which are orthogonal to minor struts with the minor struts being placed in the mold prior to forming of the major struts and a frame which supports the major and minor struts.

8. Claims 8-10, 16-18 and 23 are allowed. The prior art does not teach or suggest forming in a substrate a support structure, which includes major and minor struts that define an array of windows in a two-dimensional array of rows and columns, by successive rounds of cutting in the substrate a fraction of the total window area to be formed, filling such fraction of windows with temporary fill before the succeeding round of cutting and filling until all the window areas are cut and filled, forming a membrane layer over a top surface of the support structure, forming a mask layer over the membrane layer, and removing the fill from the windows. The prior art does not teach or suggest depositing over the filled window substrate a layer suitable for supporting a mask, depositing over the layer a layer suitable for providing a mask, patterning the layer to form a mask, and removing the temporary fill from the windows. The prior art does not teach or suggest placing in a mold which is shaped to facilitate the formation of a support structure a plurality of parallel minor struts, forming in the mold a mask support structure that comprises a frame and a plurality of major struts that are orthogonal and attached to the minor struts with the major and minor struts defining a plurality of windows arranged in a two dimensional array of rows and columns, and filling the windows with a temporary fill.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (703) 308-

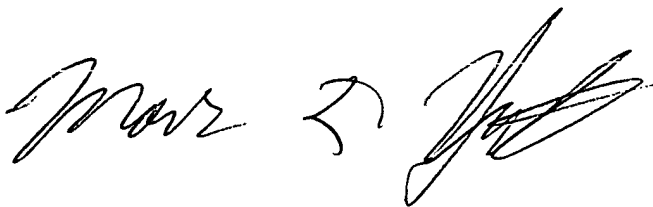
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1260. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Huff, can be reached on (703) 308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310. The After Final fax phone number is (703) 872-9311. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

srm



February 23, 2003



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
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